ROUNDUP360

Knee

✕ *For other Roundups in this issue that cross-reference with Knee see: Oncology Roundup 6; and Children's orthopaedics Roundup 7.*

Research: Sham surgery as good as arthroscopic meniscectomy ✕

■ Arthroscopic meniscectomy is one of the most commonly performed procedures worldwide for a range of indications. While few surgeons would argue about the indications for arthroscopic surgery in the locked bucket handle tear of the knee, many other indications are slightly less accepted. Millions of procedures are performed worldwide each year for patients with degenerative tears, osteochondral defects and for ACL reconstruction where the evidence is slightly poorer. Researchers in **Helsinki (Finland)** have attempted to shine a light on arthroscopic meniscectomy for degenerative medial meniscal tears in the absence of arthritis. They designed one of the few studies able to elucidate the effects of surgical intervention at all – the sham surgery study. Their multicentre randomised sham controlled study (Level I evidence) investigated the outcomes of 146 patients (aged 35 to 65). Inclusion criteria were symptoms consistent with a degenerative medial meniscus tear in the absence of radiological signs of osteoarthritis. Outcomes were assessed using outcome scores including clinical (Lysholm and Western Ontario Meniscal Evaluation Tool (WOMET) scores) and a VAS for knee pain after exercise. Follow-up was to 12 months and the patients were treated on an intention-to-treat basis. Amazingly, at the 12-month follow-up the investigators were unable to report any significant differences between the groups in any outcome measure. There were no significant differences between the two groups in the primary outcome measures, with improvements in the Lysholm score of 21.7 and 23.3 points in the meniscectomy and sham surgery group, respectively. Similarly, the WOMET score suggested slightly (but not significantly) better outcomes in the sham surgery group with improvements of 27.1 (sham) and 24.6 (arthroscopy). Again there were no differences between groups with respect to the need for subsequent knee surgery and serious adverse events.[1] In perhaps one of the most important studies undertaken in orthopaedics this year, the Finnish group have firmly reopened (and possibly closed) the debate on arthroscopic intervention for degenerate meniscal tears. Sham surgery studies are difficult to arrange, expensive and raise ethical questions, but provide essential information like this which would be impossible to gain in any other way.

Research: Distraction in knee osteoarthritis ✕

■ The treatment of patients with early onset osteoarthritis (OA) is difficult. With poor outcomes from arthroplasty (in terms of longevity and function), surgeons have reached for other options such as osteotomy, medical therapies and even joint distraction. Surgeons in **Utrecht (the Netherlands)** have presented a prospective series of patients treated with distraction for early onset osteoarthritis of the knee. The study team included 20 patients under the age of 60, with a VAS score of > 60 mm. Patients included in this study presented with end-stage knee OA and an indication for total knee replacement (TKR). They underwent two months of knee joint distraction (KJD) and their outcomes were assessed using serial VAS pain scores and the WOMAC questionnaire. This comprehensive study also included assessment of cartilage structure and function. KJD was applied for a mean of two months (54 to 64 days) and clinical parameters assessed using the WOMAC questionnaire and VAS pain score. Changes in cartilage structure were measured using quantitative MRI, radiography, and biochemical analyses of collagen type II turnover (ELISA). Follow-up was to just over two years on average and patients experienced a sustained clinical improvement, with improvements in WOMAC scores by 74% and VAS pain scores by 61%. Remarkably, the investigators also report increases in cartilage thickness (from 2.35 mm to 2.78 mm) and sustained decreases in the ratio of collagen breakdown to synthesis (as determined by ELIZA).[2] This is an interesting paper which is almost 'too good to be true'. While not a definitive study in terms of numbers of patients, this study dangles the attractive carrot of a comprehensive assessment of the effects of distraction on both the symptoms and biology of early osteoarthritis of the knee.

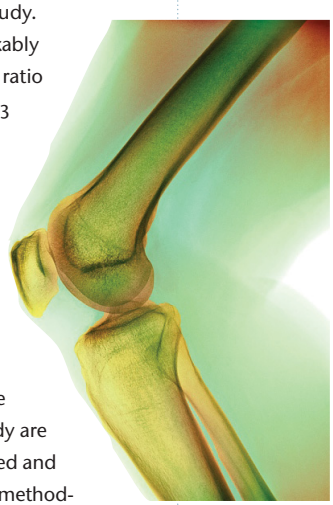
Does trans-tibial tunnel placement increase the risk of graft failure in ACL surgery?

■ There has been much debate recently in the literature and at meetings surrounding the benefits or otherwise of anatomical tunnel placement in ACL surgery, i.e. use of the medial portal to place the femoral tunnel rather than using the trans-tibial approach. Despite the popularity now of anatomic tunnel placement, there is not much in the way of comparative outcome data between the two techniques. Researchers in **Shelbyville (USA)** have designed a study with the aim of comparing the outcome of trans-tibial and anatomic femoral tunnel placement, with two primary outcome measures; reoperation rates and clinical outcomes (as measured by the Knee injury and Osteoarthritis Outcome Scores (KOOS)). They undertook a retrospective comparative series (Level III evidence) including a large number of patients operated on with both techniques at several institutions. The researchers identified 436 patients who had undergone ACL reconstruction over a two-year period with the reconstruction performed with either a trans-tibial (229 patients) or anteromedial portal (207 patients) technique. The research team used relatively complex statistical methods of multiple linear regression to determine the effect of surgical technique on outcomes (KOOS and incidence of reoperation).

The model controlled for the effects of pre-operative KOOS, patient age, sex, activity level, body mass index, smoking, graft type, and other pathology at the time of reconstruction. The statistical model was used to determine the independent effect of surgical technique as a predictor of repeat ipsilateral knee surgery and KOOS outcome score. In terms of clinical outcomes, the surgical technique wasn't a predictor of KOOS score (or subscore) for any component at six years follow-up, suggesting that the clinical outcome measures were not predicated by surgical technique. The study team had data available regarding re-intervention for 380 patients. The surgical technique was, however, convincingly a significant predictor of subsequent ipsilateral knee surgery (OR 2.49, 95% CI 1.30 to 4.78). While clinical outcomes appear to be no better for patients with anatomic tunnels, the risk of failure requiring subsequent surgery is predicated by trans-tibial tunnel placement.[3] We tend to agree with the authors that this is evidence enough to support the practice of anatomical tunnel placement.

Research: Does joint replacement prevent cardiac events?

Here at *360* we need no convincing as to the benefits of total joint replacement, representing one of the most successful medical interventions there is in terms of both health economic and functional outcomes. However, we would not have thought of joint replacement as good for your heart. Surgeons in **Toronto (Canada)** have set out to establish just that. They constructed a long-term cohort study of 2200 patients with hip or knee osteoarthritis to establish the effect that joint replacement had on their incidence of serious cardiovascular events using a propensity score analysis methodology. The study group were followed up over a 12-year period to either death or the end of the study. The rates of serious cardiovascular events for patients receiving primary total joint replacement compared with those who did not were calculated. The propensity score-matched cohort was constructed from 153 matched pairs of participants, all of whom had moderate to severe arthritis and had an exposure time of at least three years and a median follow-up of seven years. Those matched participants who underwent total joint replacement were significantly less likely to suffer a cardiovascular event during the period of the study. There was a remarkably favourable hazards ratio of 0.56 (95% CI 0.43 to 0.74). Patients in the seven-year exposure period had an absolute risk reduction of 12.4% and the number needed to treat calculation was eight.[4] The findings of this study are certainly unexpected and given the rigorous methodology this is likely a genuine finding.



How big is the pulmonary embolism problem?

Despite the vast media attention, pharmaceutical company attention, and patient awareness, the exact rate of pulmonary embolism following total joint replacement is unknown as previous studies have included heterogeneous populations containing patients with oncological diagnoses, and post-traumatic and revision surgery, all of which is likely to raise the incidence of thromboembolic events. Researchers in **Baltimore (USA)** set out to establish the incidence of pulmonary embolism following lower limb joint replacement. The research team assembled a ten-year (1998 to 2009) cohort of patients as part of the Healthcare Cost and Utilization Project Nationwide Inpatient Sample to report a very large retrospective cohort study. All patients in the sample over the age of 60 having primary joint replacement were included in the sample. The primary outcome measure was the incidence of inpatient PE although mortality was also used as a secondary outcome measure. The researchers investigated procedure, adjusting for age, gender, Charlston Comorbidity Index, atrial fibrillation, and surgical indication. In perhaps the largest ever study on any outcome in arthroplasty surgery and certainly the largest concerning thromboembolic disease, the authors included the hospital records of 5,044,403 hospital episodes after primary lower limb joint replacement. The authors report the overall incidence of PE to be 0.358% with a differing incidence by procedure type. Simultaneous joint replacements have the highest risk at 0.777%, with total hip replacement at 0.20% and total knee replacement roughly double at 0.40%. Patients undergoing bilateral joint replacements had an adjusted odds ratio 3.89 times higher than total hip replacement when other factors were controlled for.[5] The incidence of pulmonary embolism is lower in this very large series than in other reported series. The authors have identified an important adverse risk of pulmonary embolism associated with bilateral joint replacement which has never been quantified in such a large study before.

Research: Tranexamic acid leads the pack in knee replacement haemostasis

There is much poor quality evidence surrounding the use of both tranexamic acid and fibrin glues in reducing post-operative bleeding following total knee and hip replacement. Given the large number of studies with poor methodology and the suitability of the question to evaluation by a randomised controlled trial, we are not surprised to see such a study emerge. Researchers in **Barcelona (Spain)** have a done a grand job of evaluating all of the currently available options for intra-operative haemostasis during total knee replacement. They designed a randomised parallel group open clinical trial to compare fibrin glue, Tissucol (fibrinogen and thrombin) and intravenous tranexamic acid with a routine haemostasis control group. Outcomes were assessed primarily by measuring total blood loss collected in drains after surgery. The investigators also evaluated the secondary outcome measures of hidden blood loss, transfusion rate, pre- and post-operative haemoglobin, units transfused, adverse events, and mortality. The trial included 172 patients randomised to the four groups. With regards to the primary outcome measure there was significantly less blood loss in the tranexamic acid group (244.1 mL ± 223.4 mL) when compared with all the other groups, fibrin glue (553.9 mL ± 321.5 mL), Tissucol (567.8 mL ± 299.3mL) and control (563.5 mL ± 269.7 mL). There was a relatively high rate of transfusion across all the groups at 21.1%. There were no clinically relevant differences between the intervention groups although there was a significantly higher transfusion rate in control *versus* tranexamic acid group (2 *versus* 12 patients).[6] There is yet more evidence presented in this study of the efficacy of tranexamic acid in preventing and reducing post-operative haemorrhage after total knee replacement. What this study is unable to tell us about is the incidence of untoward events. This is a rather small study powered to investigate bleeding rather than prothrombotic events.

Research: Tranexamic acid is safe and efficacious according to the literature

Researchers in **Shijiazhuang (China)**, almost as if on cue, published a comprehensive meta-

analysis investigating the safety and efficacy of tranexamic acid in the published literature. They conducted a comprehensive meta-analysis of randomised controlled trials evaluating both intra-articular and systemic application of tranexamic acid in total knee replacement (TKR) patients. The authors conducted an extensive literature review for their meta-analysis, using all of the major indexing services including PubMed, EmBase, Cochrane library and Science direct. The standard 'Cochrane' style methodology was used, with two independent reviewers to assess the study quality, risk of bias and perform the data extraction. The researchers were able to include six studies in their analysis and performed meta-analysis on 647 patients. There were no increases in the rates of adverse events including DVT and PE in either the treatment or control groups across these studies. However, the use of tranexamic acid (either topical or intravenous) reduced observed total blood loss and the proportion of patients requiring blood transfusions (RR 0.28). The investigators noticed a mild dose response effect in tranexamic acid use and recommend higher doses (> 30 mg/ml).[7] When taken together, this meta-analysis and the previous RCT contribute significantly to our understanding of tranexamic acid in TKR here at *360*. While there are still relatively small numbers of patients evaluated in clinical studies, the efficacy of TXA has been demonstrated both as a single agent and against two types of tissue glue. Taken together with the safety data presented in the meta-analysis and allowing for the small numbers of patients in both studies, we cannot see why tranexamic acid infusions shouldn't become standard practice in primary total knee replacement.

Matching demand for knee replacement and follow-up

For many years the impending flood of primary and revision total knee replacement has been discussed in the literature, but the predicted overwhelming of services has never quite emerged. As technology and surgical technique has improved, life expectancy from primary joint replacement has increased and so the burden has not quite been in the expected epidemic of revision knees, but rather a potentially unmanageable follow-up responsibility. Researchers in **Mooresville (USA)** have stepped up to determine what is the optimal follow-up protocol, and have attempted to match interventions with review. They hypothesise that in the light of modern results and an increasing arthroplasty load, the frequency and type of post-operative review may require a change. The surgical team used review data from their own database including the outcome data of 16,414 patients who had undergone primary joint replacement in a single institution. They established the peak years for detected failure by comparing the conditional probability of failure (the number of failures as a ratio of the number of primaries implanted in each year of follow-up). The study team undertook further subset analysis for infection and component loosening-associated failures at every time point. Analysis was undertaken with Kaplan-Meier survival curves. The most common mechanisms of failure varied in their median intervals to failure. Infection occurred most quickly with a median presentation time of 1.9 years, while aseptic loosening (both femoral and tibial) typically occurs at a median of 4.9 years. Catastrophic failure occurred slightly earlier at 3.1 years for tibial collapse and 5.6 for instability. The median time to failure across all patients was 3.3 years, although the authors report a surprisingly low revision rate of just 1.7%. The authors suggest, given their results, follow-up at six months then years one, three, eight and 12, and then every five years thereafter.[8] This extremely useful paper has relevance to nearly all orthopaedic surgeons planning follow-up for joint replacement patients. We commend the authors on one of the most useful papers we have seen in a while.

Predicting length of stay post knee replacement

Increases in efficiency in health care are sometimes possible with more accurate modelling of capacity and resource utilisation. The introduction of standard care pathways and bundles of care in more developed healthcare systems have standardised care and improved outcomes and efficiency. Further efficiencies can be made if these pathways are tailored to individual patients. A particular area of difficulty is predicting the length of stay following planned elective procedures. Researchers in **Singapore (Singapore)** have turned their hands to the fraught task of predicting length of stay following total and unicompartmental knee replacement. The research team used a retrospective study of 1609 patients undergoing knee replacement in their institution and attempted to develop a multivariant predictive model for length of stay. The study team collected data on a range of potential covariates including patient demographics, knee function, self-reported outcome measures, surgical factors and discharge planning. The researchers established with pairwise analysis that significant predictors of increased stay were age, comorbidity, knee stiffness, depression, use of walking aids, bilateral surgery, low-volume surgeon, absence of carer at home, and expectation to receive step-down care. The researchers were able to produce a normogram type predictive model to predict with moderate accuracy (R (2) = 0.32) the length of stay for the population cohort.[9] The researchers have not undertaken any internal validation and recognise that external validation is required to establish the likely predictive value of this model. While we would agree with the authors that the ability to predict length of stay would be a real advantage, we are not sure this paper has the answer. With so many covariates in a single centre cohort we are not certain how generalisable nor how valid this model is.

Popliteal artery injury in total knee replacement

One of the more serious complications in any kind of surgery, and certainly one of the most feared in joint replacement, popliteal artery injury during total knee replacement is potentially devastating for the patient. Usually injuries are small intimal tears or false aneurysms but they can be more significant such as transection, however, all such injuries may lead to amputation. Thankfully, arterial injury following joint replacement is increasingly rare, which contributes to why we know so little about it; even the incidence is unclear. Researchers in **Uppsala (Sweden)** set out to conduct a population study to establish the incidence, injury patterns and sequelae of arterial injury following TKR. Using the Swedish valuscular registry and patient insurance databases, they were able to undertake an ambitious study to assess the types of injury treatment and outcomes. Their findings were very heartening for surgeons and patients alike. They established that the incidence of injury was just 0.017% of procedures with only 32 cases of injury between 1998 and 2010 in the whole of Sweden. The majority (78%) were sharp penetrating injuries with the remainder caused by blunt injury. Patients presented most commonly with bleeding, although ischaemia and symptoms of false aneurysm were also common presentations. Only one in three injuries was detected intra-operatively and the vast majority were treated with open surgical repair (n = 28/32). Only a single patient went on to have an amputation, with 97% being treated successfully with a vascular repair, however, the bulk of patients (n = 25/32) had ongoing vascular symptoms following their surgery.[10]

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